

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

VOL. XXII, No. 3, pp. 99-110, plates 26, 27

APRIL 26, 1937

THE TEMPLETON CROCKER EXPEDITION OF THE
CALIFORNIA ACADEMY OF SCIENCES, 1932
No. 32

THE PLANT GENUS *COLDENIA* IN THE
GALAPAGOS ISLANDS

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INTRODUCTION

History. The first species of *Coldenia* (*Boraginaceae*) to be known from the Galapagos Islands were described in 1847 as species of *Galapagoa*, a genus specially erected by Hooker f. to care for them (*Trans. Linn. Soc.* 20: 196, 197). In the rather meager material before him, Hooker distinguished two species, *G. Darwini* and *G. fusca*, differentiated in his descriptions chiefly by pubescence. Not many years later in 1862, these were recognized as species of *Coldenia* by Asa Gray and this generic disposition of the plants was accepted by Bentham and Hooker in the *Genera Plantarum*, by Hooker and Jackson in the *Index Kewensis*, by Gürke in *Die Natürlichen Pflanzenfamilien*, and by all later workers who have considered them. Until Johnston prepared his "Tentative Classification of the South American *Coldenias*" (*Contrib. Gray Herb.*, n. ser., 70: 55-61, 1924), Hooker's two original species were maintained and specimens from the islands were referred to them chiefly on characters of pubescence. But in his survey of the island material, Johnston could distinguish no specific line, remarking: "I . . . am forced to the conclusion that the archipelago has but one variable

species of *Coldenia*. The island plants vary considerably in compactness, size and pubescence of leaves, but these differences seem clearly responses to different habitats" (pages 59, 60).

Such a disposition of the island material would probably have been followed in the present instance had I not become convinced in the field, as botanist on the Templeton Crocker Expedition of the California Academy of Sciences in 1932, that more than one species of *Coldenia* could be readily distinguished. In the course of my collecting of *Coldenia*, I regret that I was not particularly critical, and it was only during my last days on the islands that three distinct plants were found in close proximity in the vicinity of Sullivan Bay on James Island, two actually growing together. Although these two plants might have been passed as variants of the same species by a too casual collector, only the slightest attention to them immediately revealed that they were entirely distinct. Other instances of this sort and further variations might have been detected at other stations had I been more alert and critical earlier. But certainly in habit and gross aspect the coldenias closely resembled each other and a closer scrutiny of plants was not deemed necessary. At Sullivan Bay it was variation in color and shape of corollas in neighboring plants which all too late focused my attention on dissimilarities in plants superficially alike; but, nevertheless, the observation was in time for me to realize that critical points could be adduced from a consideration of the flower.

About two years ago, when I came to examine critically all collections of Galapagian *Coldenia* in the Herbarium of the California Academy of Sciences (C), it was at once discovered that added to characters of habit and flower which had been noted in the field were even more important characters in the fruit, some plants having nutlets smooth and shining and others having nutlets tuberculate and dull. Four major entities and several minor forms came to be recognized; but when I sought to apply Hooker's original specific names to two of them, I was unable to do so. Hooker in his original description of *Galapagoa fusca* neglected to describe the fruit, and, from the characterization given, it was impossible to determine whether the characters described should be correlated with smooth or rough nutlets. It was at this point that I was able to examine the collections by Darwin, Macrae, and Edmonston in Herbarium Hookerianum (Herb. Hook.) at Kew in the summer of 1935, and to determine to which two of the entities the specific names *Darwini* and *fusca* should be applied.

Even at Kew all was not so simple as might be anticipated, and no little difficulty was encountered in determining which specimens should serve as types for Hooker's species. Because the specific nomenclature of the island plants depends on the decisions made, the notes prepared at Kew and at the herbarium of the University of Cambridge (Herbarium Cantabrigense, Herb. Cantab.) are given here in full.

Selection of Types. From the description of *Galapagoa Darwini*, it is clear that in Herb. Hook. at Kew there is only one sheet that has mounted on it plants which can be taken as the ones described by Hooker. (Plate 26.) On this sheet three specimens are mounted and the following data are given: Charles Island, *Edmonston*; Albatross Island, *Macrae*; and, Charles Island, *Darwin*. The data are so placed that it is not evident at first which specimen goes with which data, and this is important to determine, since only two of the three specimens are cited by Hooker; and, moreover, in the light of present knowledge at least two species are represented. By reference to Darwin's specimens in Herb. Cantab., it is immediately evident that the specimens on the right side of the sheet in Herb. Hook. are the Darwin specimens, and this is as it should be because the Darwin label is placed immediately beneath them. And by reference to the specimens in Herbarium Benthamianum (Herb. Benth.) at Kew, it is evident that the specimen in the lower left hand corner is a part of Macrae's collection from Albatross Island: and again this is as it should be, because not only does the position of the Macrae label show the closest possible affiliation for this particular specimen but also the specimen at one point overlies the Edmonston data which are written on the sheet, thus showing that the specimen taken to be Macrae's was added subsequently to the mounting of Edmonston's specimen and to the writing of his data. Thus the Edmonston data go with the two plants in the upper left hand corner of the sheet.

From a careful examination of these three specimens and a comparison of them with the original description of *Galapagoa Darwini* and with drawing of dissections prepared by Hooker, it is evident that the description and drawings do take care of both the Darwin and Macrae specimens but do not fit the Edmonston collection. This agrees with Hooker's statement in the original description that *G. Darwini* is based on collections of Darwin and of Macrae. For the type of the species, there should be no hesitancy in choosing Darwin's specimens in Herb. Hook. because (1.) the material is adequately covered by the original description of *G. Darwini* and is clearly included in Hooker's drawings of dissections; (2.) it is the first cited collection; (3.) the species named after Darwin should have as the type this specimen collected by him, if his plant is included in the original description. This decision is reached and held in spite of the fact that Darwin's collection in Herb. Hook. is labelled "Charles Island," while the island named both in the original description and in the data accompanying the specimen in Herb. Cantab. is Chatham Island; and also in spite of the fact that the specimen from Charles Island by Darwin in Herb. Benth., which is labelled *G. Darwini*, is *C. fusca* and exactly corresponds to Edmonston's plant from Charles Island in Herb. Hook.

The choice of a specimen to serve as type for *Galapagoa fusca* is likewise difficult because of conflicting data and discrepancies in

labelled specimens. In the original description, the locality given for the type and only collection cited is "Charles Island" by Darwin. Now, in Herb. Hook. the only collection by Darwin, and that given as from Charles Island, has been cautiously and critically chosen as the type for *G. Darwini*. In Herb. Benth. there is a Darwin collection from Charles Island labelled *G. Darwini* but even a casual glance shows the plant so labelled to be identical with Edmonston's collection from Charles Island in Herb. Hook.; and although the leaves of this collection are almost "destitute of those curious large setae, . . . so prominent in *G. Darwini*," the plants are not "of a lurid brown color" and the leaves are not conspicuously "rugose on the upper surface between the lateral nerves." In Herb. Cantab. there is a second specimen of *Galapagoa* said to have been collected by Darwin. Although it is labelled *G. fusca*, it cannot be that species according to the original description of *G. fusca*, and most closely resembles Macrae's collection from Albatross Island that Hooker cited with *G. Darwini*.

So the problem narrows down to the question whether there is a specimen collected by Darwin or by someone else which was available to Hooker at the time he described *Galapagoa fusca*, which, agreeing with the original description, may be selected as the type. There is such a specimen, a second collection by Macrae from Albatross Island, represented in Herb. Hook. by a very full sheet and also by an adequate specimen in Herb. Benth. This specimen fills so perfectly all the particular requirements given by Hooker in the original description of *G. fusca*, that it is unavoidable to conclude that the description of the species was based on this Macrae collection, and that an error was made in citing the original locality and collector in the literature. This conclusion is still further fortified by the drawings made by Hooker which are details evidently taken from the Macrae plant, and which are at present pinned to that specimen. That these drawings have always been attached to the Macrae specimen can be readily deduced by a study of the several sets of pin-holes on the edge of the drawing paper and along the edge of the herbarium sheet. Hence the Macrae collection from Albatross Island in Herb. Hook. is chosen as the type of *G. fusca*.

Ecology and Relationships. The species of *Coldenia* are widespread in the Galapagos Islands, and have been reported from all of the larger islands, except Duncan, as well as from several of the smaller islands. They are most frequent in loose porous soils of sandy or ashy character, and are to be counted as a characteristic element in the vegetation of sandy flats and low dunes immediately inland and above the calcareous beaches. In fact all of the species and most of the collections have been recorded from such a littoral habitat. Only *C. Galapagoa* has been commonly noted as occurring away from the strand on rocky slopes in shallow soil; and the closely re-

lated *C. fusca* is found inland on gentle slopes or flats of volcanic ash, or, more rarely, in crevices of lava pavements.

Certainly the species resemble each other closely in general aspect; the difference in appearance between individuals of the same species in youth and age is at times more pronounced than that between individuals of different species of about the same age. But there are real differences in the species as they are seen growing, although, again, to the casual observer they may seem very much alike. Both *C. Darwini* and *C. fusca*, as far as the writer has observed, are truly prostrate even to the tips of the branchlets. Where these two species grew together at Tagus Cove, they were superficially indistinguishable, and it was only after a critical examination of the collection in the laboratory that the two species were separated (*Howell No. 9514* and *9514A*). *Coldenia Galapagoa* and *C. conspicua* are more decidedly divergent, not only between themselves but also from the true mat-plants, *C. Darwini* and *C. fusca*. Neither forms a perfectly prostrate mat. Of the two, *C. Galapagoa* has the more sprawling habit but its assurgent branches develop at least a low loose habit. From all species of *Coldenia* in the Galapagos Islands, the suffrutescent habit assumed by *C. conspicua* is different, forming as it does a low broad shrubby growth, perhaps up to a half meter in height. In habit, it was in notable contrast to the prostrate mats of *C. Darwini* with which it was associated.

Johnston (*l. c.*, page 57) refers the plants of the Galapagos Islands to the section *Eddya* of the genus *Coldenia*, and considers them closely allied to the continental species *C. paronychioides* Phil., which ranges from northern Chile to Bolivia and northern Peru. The section, which also includes several species in the Mexican region, is to be recognized by the unappendaged corolla and the ventrally attached nutlets with an anterior grooved keel (cf. Johnston, *l. c.*, page 56). Without a critical knowledge of the relations on the mainland, it is scarcely feasible to propose a possible phylogeny for the insular complex, unless it would be to suggest that the variations in the Galapagian group appear to have arisen through hybridization, with consequent partial stabilization through segregation and isolation. It only remains to be stated that, although the Galapagian species are closely allied, not only genetically, but also physiologically and ecologically, nevertheless the several species seem very distinct and adequate taxonomically.

Acknowledgments. In the preparation of this review of the Galapagian coldenias, specimens have been borrowed from the Gray Herbarium of Harvard University (G) and from the Herbarium of the Brooklyn Botanic Garden (B). In Europe, studies were made in England at the Royal Herbarium, Kew (Kew.), and the Herbarium of the University of Cambridge (Cantab.); and, in Sweden, in the Herbarium of the Kungliga Riksmuseum (Holm., *i. e.*, Herbarium Holmiense). To the officers and assistants of all of these institutions,

I am deeply grateful for the opportunity for study and for the many courtesies and privileges I have enjoyed. Particularly do I wish to thank Dr. T. A. Sprague, Deputy Keeper of the Royal Herbarium, Kew, for his valuable advice and assistance in helping me to interpret the confusion of *Coldenia* specimens; as always, I am grateful to Mr. Templeton Crocker, not only for the advantages he gave me as botanist on his expedition in 1932, but for his continued interest in the studies of the collections obtained; and, I wish to express my gratitude to Miss Alice Eastwood who made possible my European summer and all that it has meant to me.

TAXONOMIC TREATMENT

KEY TO THE GALAPAGIAN SPECIES OF *Coldenia*

- A. Nutlets nearly or quite smooth and shining.
 - B. Plants prostrate; corolla sordid-white, the tube campanulate-funnelform; hairs on the stem spreading or appressed-ascending. 1. *C. Darwini*
 - B. Plants bushy, to 3 or 4 dm. tall; corolla pure white, the tube cylindrical; hairs on the stem mostly retrorse. 2. *C. conspicua*
- A. Nutlets granular to finely tuberculate, dull.
 - C. Stems prostrate; corolla 1-2 mm. long, the tube campanulate-funnelform; stamens about 1 mm. long; style-branches distinct or united only near the base. 3. *C. fusca*
 - C. Stems somewhat assurgent; corolla 3-4 mm. long, the tube cylindrical; stamens 3.5 mm. long; style-branches united 0.5-1 mm. above base. 4. *C. Galapagoa*

1. *Coldenia Darwini* (Hook. f.) Gray

Plate 26, Plate 27, figure 1

Galapagoa Darwini Hook. f., Trans. Linn. Soc. 20: 196 (1847)

Coldenia Darwini (Hook. f.) Gray, Proc. Am. Acad. 5: 341 (1862)

Stems prostrate, forming a mat 4-8 dm., or perhaps even a meter, in diameter, woody and dark at base, the branchlets numerous, cinereous, tomentellous, or more frequently the pubescence upwardly appressed and strigose or subhirsute; leaves small, elliptic to narrowly ovate, acute, the midrib depressed above, very prominent below and nearly filling the concavity formed by the strongly revolute margins, lateral veins not evident, the hairs of two sorts, the shorter hairs substrigose and not so stout, the longer hairs setose and scattered, sometimes abundant, sometimes nearly lacking; calyx-lobes more or less unequal, free nearly to the base, 1-2 mm. long in anthesis; corolla 1.5-2.5 mm. long, campanulate-funnelform, the lobes spreading, rounded; stamens attached near the bottom of the tube, about 1 mm. long; style about 1 mm. long, the branches distinct nearly or quite to the base; nutlets narrowly ovate dorsally, 0.75 mm. long, black, smooth and shining above and on the back, very minutely reticulate-roughened and only sublucid on the sides near the base, the groove on the ventral angle scarcely widened upward.

Collections studied. Type collection, *Darwin in 1835* ("Charles Island," Kew. in Herb. Hook., frag. G; "Chatham Island," Herb. Cantab.). Galapagos Islands: *Edmonston in 1846* (G); *Andersson No. 135* (Kew.). Abingdon: on lava beds near the shore, *Stewart No. 3144* (C). Albemarle: *Macrae in 1825* (Kew. in Herb. Hook. and Herb. Benth.); east side, 3 miles south of Equator, *Howell No. 9610* (C); Tagus Cove, *Stewart No. 3146* (C, G), *Howell No. 9514A* (C). Bindloe: *Baur No. 383* (G); *Snodgrass & Heller No. 764* (G); *Stewart No. 3147* (C); northwest coast, *Howell No. 8566* (C). Charles: *Darwin in 1835* (Cantab., a specimen different from the type collections); on sand beaches, *Stewart No. 3148* (C); Black Beach, *Svenson No. 181* (B, G, Kew.), *Howell No. 9383* (C); Post Office Bay, *Howell No. 8810* (C). Chatham: *Andersson in 1852* (G, Holm., frag. C); Bassa Point, *Stewart No. 3149* (C, G). James: Orchilla Bay, *Baur No. 384* (G); Sullivan Bay, *Howell No. 10011* (C); Bartholomew Island at Sullivan Bay, *Howell No. 10060* (C).

The collections of this species present two extremes in the character of pubescence. A few collections from Chatham and Charles islands have the stems almost villous-tomentose with soft spreading hairs. The majority of specimens, however, have the stems more or less bristly-hairy as well as strigose with usually closely appressed hairs. The type collection belongs to the former variant that is rare; the plants generally collected belong to the second variant. The recognition of these differences by named forms would perhaps be desirable, although the character is variable, and a precise definition and separation is scarcely possible.

Of all the specimens of *C. Darwini*, only one has been seen which seems to agree with the type in every detail, and this is Stewart's collection from Bassa Point, Chatham Island. This fact lends strong support to the writer's belief that the original collection is correctly labelled in Herb. Cantab. and that the specimen in Herb. Kew., which is to be taken as the type, is incorrectly labelled Charles Island. (Cf. discussion in Introduction.) It is true that Stewart's collection from Charles Island also resembles Darwin's plants in critical details of pubescence, but the plant does not have the very close, almost identical resemblance, which is shared by the type collection and Stewart's plants from Chatham.

2. *Coldenia conspicua* Howell, spec. nov.

Plate 27, figure 1

Fruticulus argenteus, 3-4 dm. altus; caulibus assurgentibus vel suberectis, basi lignosis et vestitis cortice fusco tenuiter sulcato, ramulis numerosis, cinereis pilis retrorsis vel subpatentibus; foliis ovatis vel ovato-lanceolatis, strigoso-canescensibus, 1.5-2 mm. longis, petiolis villosis-hirsutis, costa prominenti, costis lateralibus haud manifestis; floribus fere latentibus inter folia congesta ramulorum nanorum; segmentis calycis oblongis, inaequalibus, longissimis 2 mm. longis, brevissimis 1.5 mm. longis, post anthesin maioribus et coriaceis; corolla candida, 3 mm. longa,

tuba fere cylindracea, inappendiculata; staminibus glabris, 2 mm. longis; stylo 2 mm. longo, ramis 1.5 mm. longis; nuculis circa 0.75 mm. longis, partim inclusis basibus segmentorum calycis, laevibus, nitentibus, atris, angusto-ovatis, subacutis, rotundatis dorso, acutis ventre, sulco ventrali subaequaliter lato omnino.

Low pale bushes, 3-4 dm. tall, the stems loosely spreading or suberect, woody below and covered with a shallowly furrowed light brown bark, much-branched above, the upper stems cinereous with mostly close retrorse or somewhat spreading pubescence, the primary internodes long, the secondary branches abbreviated, spur-like and bearing rosette-like clusters of numerous small crowded leaves; leaves ovate or ovate-lanceolate, strigose-canescens, 1.5-2 mm. long, petioles hirsute-villous, those of the primary leaves longer, midvein prominent but lateral veins not at all evident; flowers nearly concealed among the congested leaves of the dwarf shoots; calyx-divisions oblong, unequal, in flower the longest 2 mm. long, the shortest 1.5 mm. long; corolla white, not sordid, 3 mm. long, the tube nearly cylindrical, without appendages; stamens glabrous, 2 mm. long; style 2 mm. long, the branches about 1.5 mm. long; nutlets partly enveloped by the concave base of the calyx-divisions, smooth, shining, black, narrowly ovate, subacute, rounded dorsally, acute ventrally, the ventral groove about equally wide throughout.

Type: Herb. Calif. Acad. Sci., No. 229734, collected on the **north-west side of Bartholomew Island at Sullivan Bay, James Island, Howell No. 10059**, June 14, 1932. The plants were abundant on an ashy talus, conspicuously mottling the dark brown slope with bright silvery patches. This species was also collected on the mainland of James Island where it grew in sandy stretches along the shore of Sullivan Bay, *Howell No. 10010*, June 13, 1932. It has not been seen in any other collection from the Galapagos Islands. At both stations where this very distinct species was detected, it grew with the strictly prostrate *C. Darwini*, but no intermediates or notable variants of either species were seen.

From the particular combination of characters which mark *C. conspicua*, it would appear that it may have arisen through the hybridization of *C. Darwini* and *C. Galapagoa*, the two species which are locally abundant at Sullivan Bay. If that be the case, the distinctness and stability of the *C. conspicua* population would seem to indicate that the interspecific crossing occurred long ago, and, that from the possibly variable filial descendants, the extremely rigorous desert condition at Sullivan Bay has selected the single successful survivor.

3. *Coldenia fusca* (Hook. f.) Gray

Plate 26

Galapagoa fusca Hook. f., Trans. Linn. Soc. 20: 197 (1847)

Coldenia fusca (Hook. f.) Gray, Proc. Am. Acad. 5: 341 (1862)

Stems prostrate, forming cinereous or fuscous mats 1.5-8 dm. across, woody and dark below, the branchlets cinereous, pubescent with ascending subappressed hairs, or the hairs rarely spreading; leaves small, elliptical to ovate or subrotund, obtuse or subacute, pubescence strigillose with the hairs appressed or subhirsute with the hairs suberect and bristly, loosely subsericeous below, both the midrib

and lateral veins prominently impressed above and evident below, margins very narrowly revolute; calyx 1.5 mm. long, the tube half as long; corolla campanulate-funnelform, 1–2 mm. long, the tube tending to be cylindrical; stamens about 1 mm. long, attached somewhat above the bottom of the tube; style 1–2 mm. long, the branches distinct to the base or sometimes united a very short distance; nutlets dark brown or black, 0.75 mm. long, lanceolate-ovate dorsally, subobtuse, dull, granular or tuberculate, the ventral groove somewhat widened upward.

Collections studied. Type collection, Albemarle Island, *Macrae in 1825* (Kew. in Herb. Hook., type, and in Herb. Benth., frag. G). Albemarle: Tagus Cove, *Snodgrass & Heller No. 180* (G), *Howell No. 9514* (C); southern part, *Baur No. 382* (G); Villamil, *Stewart No. 3145* (C, G), *Howell No. 8919* (C); in lower region on trail to Santo Tomás, *Howell No. 8969*. Barrington: *Snodgrass & Heller No. 468* (G), *Stewart No. 3155* (C, G). Brattle: *Stewart No. 3156* (C, G). Chatham: lower region, southwest end, *Baur No. 217* (G); Wreck Bay, *Howell No. 8612* (C). Hood: *Baur No. 218* (G); *Stewart No. 3153* (C, G); beach at Gardner Bay, *Howell No. 8647* (C). Indefatigable: on sand beaches, southeast side, *Stewart No. 3150* (C, G); Academy Bay, *Svenson No. 10* (B, G, Kew.), *Howell No. 9057* (C), *Schimpff No. 9* (C, Holm.). James: James Bay, *Howell No. 9712* (C).

Three collections of *C. fusca* have been seen with very dubious data. Two are in Herb. Kew. from Charles Island, one by Darwin (Herb. Benth.), the other by Edmonston (Herb. Hook.). Critical study of the specimens would seem to indicate that they are parts of the same collection. Until *C. fusca* is again collected on Charles Island, these collections cannot be regarded seriously in distributional studies in the archipelago. The third dubious collection is what is taken to be a mixture of *C. fusca* and *C. Galapagoa*, said to have been collected by Andersson on "insula Indefatigable" (Herb. Gray.). Undoubtedly the data are authentic for the specimen of *C. Galapagoa*, but it is likely that Andersson collected the material of *C. fusca* at either Tagus Cove, Albemarle Island, or at James Bay, James Island, at both of which places the frigate *Eugenie* visited and at both of which *C. fusca* is known to grow. No specimen of *C. fusca* collected by Andersson was noted at the herbarium in Stockholm.

Variations in *C. fusca* appear to be the only ones decided enough to offer entities worthy of taxonomic recognition. Because of the nature of these variations, the logical treatment of them would be to name a series of forms, one for nearly every one of the islands where the species occurs. Plants typical of the species are found on Albemarle and James islands; and, what is probably a typical plant, has been collected on the southeast side of Indefatigable (*Stewart No. 3150*). As noted above, it is doubtful whether the Darwin and Edmonston collections reported from Charles Island are correctly labelled, but the collections represent typical *C. fusca*. All the other collections, distributed across the southern end of the archipelago, are variable in pubescence, leaves, flowers, and nutlets. All have

leaves averaging slightly larger than those of typical *C. fusca*, a character in which they approach *C. Galapagoa*. There is a tendency for the pubescence to be spreading, either hirsutulous or subvillous, this character being especially noticeable in specimens from the widely separated Hood and Brattle islands. The plants on Hood Island have the undivided part of the style longer than in any other Galapagian *Coldenia* except *C. Galapagoa*. The most notable divergence from typical *C. fusca* is found in the fruit of plants from Chatham Island, Barrington Island, and Academy Bay, Indefatigable Island. Instead of having the nutlets finely but distinctly tuberculate as is typical for the species, these plants have the nutlets dull and very minutely granular. For the present it seems desirable to consider all these variations as simply *C. fusca*, though eventually some should perhaps be recognized taxonomically. The group might well afford exhaustive study in the problems of the origin of small entities or incipient species through segregation and isolation in a variable complex.

4. *Coldenia Galapagoa* Howell, spec. nov.

Plate 27, figure 2

Planta humilis, subhirsuta, ramosissima; caulibus patentibus, non vere prostratis, subassurgentibus, 0.8–5 dm. longis, basi lignosis, cortice tenui, atro-fusco, ramulis villosis vel subhirsutis; foliis ovatis oblongo-ovatis vel oblongo-obovatis, raro angustioribus et oblongo-lanceolatis, 4–6 mm. longis, 2–4 mm. latis, subhirsutis ad hispidis, nervis profunde impressis supra et prominentibus infra, petioliis dense et hirsute floccoso-ciliatis; floribus sessilibus et fere latentibus inter folia congesta; calyce 2–3 mm. longo, tuba circa 1 mm. longa, lobis subinaequalibus, lineari-oblongis, pilosis, pilis longis, albis, erectis, setiformibus; corolla sordido-alba, 3–4 mm. longa, tuba subcylindracea, 2.5 mm. longa, inappendiculata; staminibus glabris, 3.5 mm. longis; stylo 2.5–3 mm. longo, ramis 1.5–2 mm. longis; nuculis minute tuberculatis, atris, subovatis, apice oblique acutis, 0.75 mm. longis, rotundatis dorso, angulatis sulcatisque ventre, sulco superne paulum dilatato.

Plants low and spreading, forming loose mats 1.5–10 dm. across, the stems not strictly prostrate, somewhat assurgent, woody at the base and covered with a thin black-brown bark, the branches numerous, villous or subhirsute, the longer hairs straight, the shorter hairs generally somewhat retrorse, the primary internodes long, the secondary branches short and leafy-congested; leaves ovate, oblong-ovate, oblong-obovate, or rarely narrower and oblong-lanceolate, 4–6 mm. long, 2–4 mm. wide, subhirsute to hispid, the veins deeply impressed above and prominently raised below, the petioles densely and hirsutely tufted-ciliate; flowers sessile and nearly concealed among the leaves; calyx 2–3 mm. long, the tube nearly 1 mm. long, the lobes somewhat unequal, linear-oblong, long-hairy with white bristly erect hairs; corolla sordid-white, 3–4 mm. long, the tube subcylindrical, 2.5 mm. long, without appendages, the lobes rotund-oblong, entire or undulate, a little more than 1 mm. long; stamens glabrous, attached at base of corolla-tube, 3.5 mm. long; style 2.5–3 mm. long, the branches 1.5–2 mm. long; nutlets finely tuberculate, black, ovate, obliquely acutish, 0.75 mm. long, rounded dorsally, angled and grooved ventrally, the groove somewhat widened upward.

Type: Herb. Calif. Acad. Sci., No. 229733, from **higher reaches of the beach, Conway Bay, Indefatigable Island, Howell No. 9862, June 8, 1932.**

Other collections studied. Galapagos Islands, *Andersson No. 136* (Kew.). Daphne: *Wheeler Rose & Beebe No. 81* (G); Daphne Major, *Pool No. 294* (B, G). Indefatigable: *Andersson in 1852* (G, Holm., frag. C); Conway Bay, *Baur No. 385* (G), *Chapin No. 1143* (B); north side, *Snodgrass & Heller No. 679* (G), *Stewart No. 3151* (C, G), *Howell No. 9882* (C). James: *Sullivan Bay, Howell No. 10033* (C). Jervis: at 950 ft. elevation, *Stewart No. 3152* (C); slopes above north end of island, *Howell No. 9767* (C). Seymour (South): *Snodgrass & Heller No. 587* (G); *Wheeler Rose & Beebe No. 3* (G); in sand, *Svenson No. 264* (B, G); middle western part, *Howell No. 9937* (C).

Coldenia Galapagoa is obviously related to *C. fusca* but it differs in gross appearance and in the larger size of all its parts. Although distinct as a specific entity, it is a variable plant and the several islands support races which may be worthy of formal recognition when they are more fully known. Most conspicuous among these forms is the very pale one which grows on the volcanic slopes above Sullivan Bay, James Island; and the narrow-leaved one which is found on South Seymour Island. The center of distribution of the species is in the north central part of the archipelago. It is believed appropriate and fitting that this species should bear as a specific name the old generic name given by Hooker to the coldenias of the Galapagos Islands.

PLATE 26

The sheet carrying the type specimen of *Coldenia Darwini* in Herb. Hook. at Kew. The type of *C. Darwini* consists of the two specimens on the right. The lower specimen on the left is also *C. Darwini*, collected by Macrae on Albemarle Island and cited by Hooker. The two upper specimens on the left, collected by Edmonston, are *C. fusca*. Photographed at Kew.

PLATE 27

Fig. 1. *Coldenia conspicua* and *C. Darwini* on ashy slopes of Bartholomew Island at Sullivan Bay, James Island. Plants of *C. conspicua* are larger and bushy, those of *C. Darwini* are prostrate. A portion of a plant of *Opuntia galapageia* Hensl. is in the immediate foreground. Photographed by Toshio Asaeda.

Fig. 2. Looking east from James Island to Sullivan Bay and Bartholomew Island. The low pale plants in the foreground are *Coldenia Galapagoa*. Photographed by J. T. Howell.